

**THE CRANE FLIES (DIPTERA: TIPULIDAE)
OF COCOS ISLAND, COSTA RICA, WITH DESCRIPTIONS
OF FOUR NEW SPECIES¹**

George W. Byers²

ABSTRACT. Eleven species of Tipulidae, all in subfamily Limoniinae, are recorded from Cocos Island, Costa Rica. Four new species, *Limonia (Rhipidia) hoguei*, *Limonia (Caenoglochina) paniculata*, *Helius brunneus*, and *Orimarga (Diotrepha) flavescens*, are described and illustrated. The ecology and zoogeography of the tipulid fauna of Cocos Island are briefly considered.

RESUMEN. Once especies de la familia Tipulidae, todas que pertenecen a la subfamilia Limoniinae, se reporta de la Isla del Coco, Costa Rica. Se describe y ilustra cuatro especies nuevas: *Limonia (Rhipidia) hoguei*, *Limonia (Caenoglochina) paniculata*, *Helius brunneus* y *Orimarga (Diotrepha) flavescens*. Se consideré, además, en breve, la ecología y zoogeografía de la fauna de tipúlidos de la isla.

INTRODUCTION

According to legend, there is a fortune in pirate gold buried somewhere on Cocos Island. Since the days of the conquistadores, however, one treasure-seeker after another has come away empty-handed from this tiny tropical island. For those content with less than gold, the remote island, some 500 km (300 mi) southwest of Costa Rica, still has much to offer. For more than 300 years, it served as a source of coconuts and fresh water for passing vessels.

Cocos Island, at 5°32'57"N, 86°59'17"W, is a rugged volcanic island of about 46.6 square km in area and 23.3 km in circumference, with elevations up to about 850 m (2790 ft) (Hertlein 1963). It receives heavy rainfall throughout the year and has temperatures from 20 to 33°C (68 to 92°F). As a result, it has numerous small streams and waterfalls and is covered by a luxuriant growth of palms, ferns, cecropia trees, and other tropical rain-forest plants. Stewart (1912) judged the flora to be that of an oceanic island to which mainland plants had been transported by ocean currents, wind, or birds. It is the consensus of biogeographers who have studied the island that it is a true oceanic island of relatively recent (probably Pleistocene or Pliocene) origin, and that its fauna, other than species evidently introduced by human visitors, was received by transport over the open ocean (Hertlein 1963). That is, although Co-

cos Island rises from an undersea ridge, there is no evidence to indicate it may ever have had a land connection to Central or South America.

Long ago, biologists took an interest in the island because of the contrasts it offers to the near-desert Galápagos some 630 km (350 mi) on to the southwest. While the climate of the Galápagos is affected largely by the cold Peru, or Humboldt, Current that turns westward from the coast of South America as the South Equatorial Current, the Cocos Island climate derives mainly from the warm, eastward-flowing Equatorial Countercurrent. The presence of the Equatorial Countercurrent helps to explain the abundant rainfall on verdant Cocos Island but contributes little to an understanding of the origins of the island's insect fauna. Periodically, however, there have been shifts in the current, which could transport insects living in driftwood, or rafting on floating vegetation, from the coasts of Central America to the island. While July average surface winds over Cocos Island are southerly or from the southeast, those of January blow generally from Central America (i.e., from the northeast) and could introduce mainland insects, especially those that are not strong fliers.

Two recent trips to Cocos Island from the Natural History Museum of Los Angeles County, California, particularly by Charles L. Hogue (Curator of Entomology) and Scott A. Miller (Research Associate), have yielded some 14,000 specimens of insects and arachnids. These add greatly to the small, previously existing collections of arthropods from the island, mostly made incidentally during studies of the vertebrate or plant biota. Hogue and Miller have assembled all extant collections and are attempting to identify the entire entomofauna as part of a biogeographical study.

All collections that include Tipulidae were made at Wafer Bay (named for early explorer Lionel Wafer), where there is safe anchorage and a beach (in contrast to the steep, rocky shoreline of most of the rest of the island). This is at the mouth of the Río (or Arroyo) Genio. Virtually all the crane flies were

1. Review committee for this contribution: Paul H. Arnaud, Jr., Charles L. Hogue, Henry Knizeski, and William J. Turner.

2. Department of Entomology, University of Kansas, Lawrence 66045. University of Kansas Contribution No. 1774.

obtained by use of Malaise traps or were attracted to 15-watt ultraviolet or fluorescent light traps. It should be pointed out that, for some reason, lights attract particularly female crane flies.

A small number of Tipulidae collected on Cocos Island by botanist Ira L. Wiggins in 1967 were recently studied by Professor Charles P. Alexander. From among these, Alexander (1978) described two new species, *Limonia (Geranomyia) coeensis* and *Limonia (G.) wigginsii*. This collection also included a few species widely distributed in tropical America. All the species found by Wiggins were collected again by Hogue and Miller, who also secured several additional species, of which four—all apparently endemic to Cocos Island—are described as new in the following account.

SYSTEMATICS

Tipulidae of Cocos Island

The crane fly fauna of Cocos Island is restricted to representatives of the subfamily Limoniinae, as is usual for tropical Pacific islands. In the large, virtually cosmopolitan genus *Limonia* (tribe Limoniini), the subgenera *Rhipidia*, *Geranomyia*, and *Caenoglochina* are represented by numerous individuals among the specimens at hand, but curiously there are no flies of the subgenus *Dicranomyia*. *Rhipidia*, *Geranomyia*, and *Dicranomyia* have abundant species in tropical America; the smaller group *Caenoglochina* is wholly neotropical. Species of *Helius* and *Orimarga* (also Limoniini) are also present. Species of the tribes Pediciini and Hexatomini are apparently not found on the island, but the first of these tribes is only poorly represented anywhere in the Neotropical region. Of the Eriopterini, two widely distributed species of *Gonomyia* have reached Cocos Island.

Holotypes, allotypes, and most of the paratypes of the following new species are in the collection of the Natural History Museum of Los Angeles County, Los Angeles, California. A small number of paratypes have been deposited in the Snow Entomological Museum, University of Kansas, Lawrence.

Limonia (Rhipidia) domestica (Osten Sacken)

Three subspecies of this unusually widespread species have been recognized, one in Brazil, one in Ecuador and Peru, and the typical form recorded from eastern North America as far north as Iowa and Maryland, from many parts of the Antillean region, and from northern South America (Alexander and Alexander 1970). Specimens from Cocos Island do not conform exactly to the descriptions of any of these subspecies. Rather than describe them as an insular subspecies, I choose to recognize their specific affinity only. Cocos Island records: Wafer Bay, 17–22 April 1975, C.L. Hogue (1 ♀); in Malaise trap, Sta-

tion 3 (Río Genio), Wafer Bay, 24 March 1978 (1 ♂), same but 25 March (1 ♂, 1 ♀), same but 26 March (1 ♂).

Limonia (Rhipidia) hoguei new species

Figures 1-5

DESCRIPTION. Description based on one ♂, two ♀♀, pinned.

Head. Dorsum dark brown grading into brown at sides, with silvery pollinosity and black bristles. Eyes narrowly separated dorsally by about width of two rows of ommatidia, widely separated ventrally. Rostrum and palps dark brown. Antennal scape and subspherical pedicel blackish brown in both sexes; flagellum dark brown, with 12 flagellomeres. Flagellum of male (Fig. 1): first flagellomere wider than long, second with single, thick ventral lobe over half length of segment; flagellomeres 3–8 bipectinate, or biflabellate, with inner (mesal) flabellations shorter and thicker than outer ones on segments 3, 4, and 8; flagellomere 9 with single ventral pectination; flagellomeres 10–11 not modified, 12 as long as 10 and 11 together; setae on flagellomeres 2–9 conspicuously longer than respective segments. Flagellum of female nodulose, except first flagellomere conspicuously wider than long, as in male; setae short.

Thorax. Pronotum brown. Mesonotal prescutum dull orange with three dark reddish brown longitudinal stripes; broad median stripe and narrower, more lateral stripes connected above pseudosutures in holotype and allotype (somewhat so in paratype), producing four orange spots, two short ones before level of pseudosutures, two longer ones behind. Scutum and scutellum unevenly brown, grading into light brown at sides. Halteres light brown throughout. Pleural surfaces mostly brown, yellowish brown on lower sternopleurite (katepisternum) and meron. Upper ends of coxae brown, lower ends yellowish brown. Femora sordid yellowish brown, slightly expanded and darkened to blackish brown at tips. Tibiae narrowly yellowish brown at base, otherwise dark brown; tarsi dark brown; claws slender, with basal tooth.

Wings patterned approximately as in *L. willistoniana* Alexander (Alexander 1914), with diffuse clouding of grayish brown in all cells, six more distinct darkened areas near anterior border of wing: (1) centered on Sc₂ and R₂, (2) over fork of Rs, (3) at fork of Sc, (4) at origin of Rs, (5) midway between arculus and origin of Rs, and (6) over the humeral cross-vein, arculus, and origin of M (this last spot more diffuse than other five). Clear spots near tip of 2A in cell 1A, in cell R₁₊₂ and extending into cell R₃, in middle of cell 1st M₂, and between darkened spots listed above.

Abdomen of Male. General color sordid yellowish brown; terga 2–5 with darker brown posterior margins; sterna slightly paler than terga; pleural membranes blackish brown. Tergum 8 (Fig. 2) broadly emarginate, tergum 9 much narrower than 8, rounded at sides, with shallow, rounded posterior indentation. Proctiger nearly transparent, two-thirds as wide as ninth

tergum at base, abruptly narrowed near midlength, extending backward beyond rostral tips of ventral dististyles. Basistyles (Figs. 2, 4) each with conspicuous, setiferous ventral lobe. Dorsal dististyle evenly curved, generally blackened but slightly paler near base. Ventral dististyle (Fig. 2, vd) with moderately elongate rostrum bearing two thick spines, their bases well separated, outermost on slight elevation. Gonapophyses (Figs. 3, 5, gon) blackened in upturned apical half, sharply pointed. Aedeagus (Fig. 5) bilobed at apex, with short apicolateral spines and two setae at base on each side.

Abdomen of Female. Terga and sterna sordid brown, indistinctly darker posteriorly; cerci and hypovalves amber-colored. Cerci short, evenly upcurved to sharp tips, closely appressed to each other in dorsal aspect. Hypovalves extending approximately to midlength of cerci.

Length of body, excluding antennae, male (holotype), 4.6 mm; female, 4.3–4.7 mm (allotype 4.7 mm). Wing length, male, 5.0 mm; female, 4.6–5.0 mm (allotype 5.0 mm).

TYPES. Holotype, male, Wafer Bay, 17–22 April 1975, collected by C.L. Hogue; specimen has had abdomen removed, softened, stored in microvial on same pin as rest of specimen. Allotype, female, same data as holotype. Paratype, female, at 15-watt ultraviolet lamp, Station 6 (west bank of Rio Genio, 200 m south of river's mouth), Wafer Bay, 27 March 1978, C.L. Hogue and S. Miller.

DIAGNOSIS. *Limonia (Rhipidia) hoguei* resembles most closely *L. (Rh.) willistoniana* Alexander (originally described as *costalis* by Williston; for best description and figures, see Alexander 1970: 19, 25) from the Windward Islands (St. Vincent, Dominica) and Costa Rica. It is also similar to *L. (Rh.) luquilloensis* Alexander of Puerto Rico (Alexander, 1950: 207). The male of *L. hoguei* differs from both of these in having only six bipectinate flagellomeres (instead of seven) and sharply pointed gonapophyses (instead of bluntly tipped). I have not been able to compare females of these three species to determine in what ways they differ.

ETYMOLOGY. This species is named for its collector, Dr. Charles L. Hogue, in recognition not only of his field studies of the insects of Cocos Island but also his outstanding research on nematoceros Diptera, particularly the Blephariceridae.

REMARKS. Three parasitic Acarina were attached to the ventral surface of the abdomen of the holotype. During the softening process, these became dislodged. They are at present preserved in the vial containing the crane fly's abdomen.

Limonia (Caenoglochina) paniculata new species

Figures 6–11

DESCRIPTION. Description based on 5 ♂♂, 36 ♀♀, pinned.

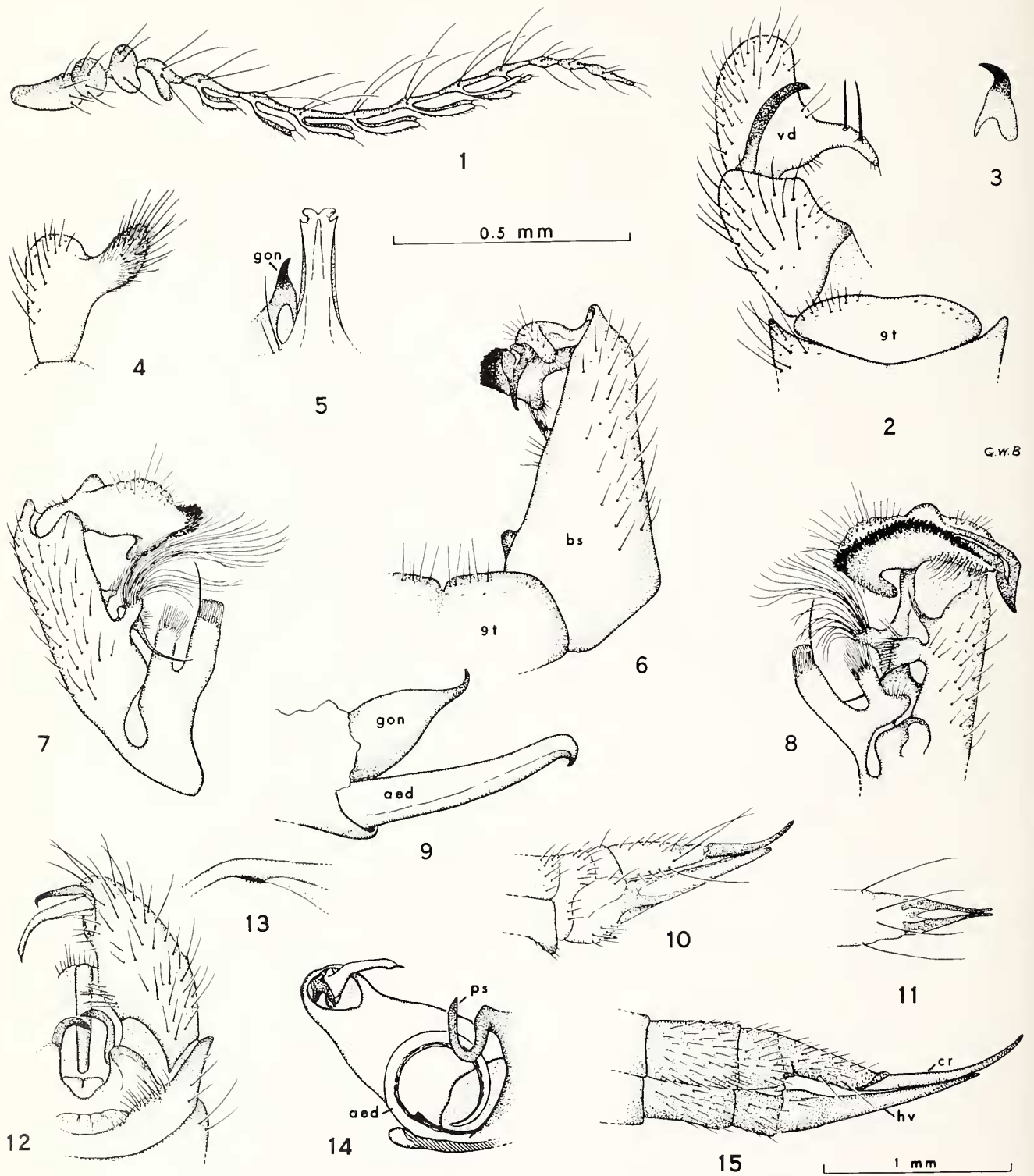
Head. Occiput dark gray with fine, silvery pollinosity. Eyes large in both sexes, contiguous or nearly so both on vertex and beneath rostrum on gular surface. Rostrum and maxillary palps sordid yellowish brown. Scape brown at base; pedicel and apex of scape sordid yellowish brown; flagellum grayish brown with

12 flagellomeres, each pilose, with verticils arising from near midlength; apical flagellomere about 1.4 times as long as penultimate one.

Thorax. Pronotum brown. Mesonotal prescutum polished, yellowish brown with broad brown median stripe abruptly widened in posterior half. Scutum and scutellum brown on elevated parts, yellowish brown where more depressed; mesonotal postnotum light brown. Knobs of halteres dusky brown, stems pale yellowish brown. Pleural surfaces light yellowish brown except for indistinct pale brown spot above anterior coxa. Femora sordid yellowish brown, palest basally, darkest apically; tibiae and tarsi grayish brown; claws apparently not toothed.

Wings lightly tinged with grayish brown, iridescent; stigma not much darker than ground color, its limits indistinct; diffuse brown clouding along vein R_3 , in much of the cell R_2 (especially along costa) and outer cell R_3 . Vein Sc_1 joins C and Sc_2 joins R_1 opposite approximately midlength of Rs. Cell 1st M_2 nearly rectangular in most specimens, basal section of M_3 being in nearly transverse alignment with m cross-vein; when m is more diagonal, M_3 still bends rectangularly.

Abdomen of Male. Terga 2–8 grayish brown, corresponding sterna paler, from sordid yellowish brown to light grayish brown. Ninth tergum yellowish brown with brown posterior and lateral borders, broadly bilobed, with several straight, black setae on posterior one-third (Fig. 6). Basistyles each bearing six tufted lobes of varying complexity, three of these on common sclerotized base joined to ventral base of basistyle and more broadly attached by membrane across deep ventral and mesal notches (Figs. 7, 8). Most ventral of these lobes about 3 times as long as wide, truncate at apex and bearing row of stiff, golden-yellow setae with recurved tips and one long, straight seta at dorsal end of row. Middle lobe of ventral group about twice as long as wide, its rounded apex covered with tuft of yellowish hairs; dorsalmost lobe blunt, with only a few hairs. From ventromesal surface of each basistyle extends a small, flattened lobe (narrower at base than at apex in some males) bearing conspicuous, fanlike array of about 20 long, stiff, yellow setae; this fan divided into more posterior group of longer, sinuous setae and more anterior group of shorter, more strongly curved setae; arrangement fixed, setae springing back, wirelike, when dry and even after boiling in water with trisodium phosphate and preservation in alcohol. Above "fan" a spatulate, strongly sclerotized lobe with long terminal spine curving ventrad and row of dark hairs along apical edge above base of spine. Small, subconical, setiferous lobe on mesal surface of basistyle close beneath dististyle. Single, large dististyle complex, generally concave on lower or inner surface, convex on upper or outer surface, wider dorsoventrally than length from base to mesal edge. Dorsal apex of dististyle a strongly sclerotized, down-curved, acutely tipped blade grooved along its mesal surface (Figs. 6, 8), ventral apex a thick, rounded, hairy lobe curved dorsolaterad; ridge of dense, black, short but thick setae along most of mesal margin. Aedeagus (Fig. 9) elongate but not otherwise modified, with two recurved apical points. Gonapophyses thin, compressed, sclerotized blades,



slightly concave on inner surface, each with upturned, mucronate apex.

Abdomen of Female. Terga 2–8 sordid grayish brown, corresponding sterna 2–7 slightly paler; terga 9–10 yellowish brown except posterior end of tergum 10 slightly darker brown. Cerci and hypovalves amber brown; rounded basal portion of sternum 8 yellowish brown; bases of hypovalves dark brown in ventral aspect. Elongate setae on ventral margins, sides, and dorsum of tergum 10 (Figs. 10, 11). Eighth tergum extended laterally around base of sternum, edges meeting at ventral midline. Cerci bowed slightly apart near midlength (Fig. 11).

Body length (frons to tip of abdomen), male, about 5.0–5.4 mm (holotype 5.4 mm); female, 5.6–6.4 mm (allotype 5.9 mm). Wing length, male, 5.2–5.9 mm (holotype 5.6 mm); female, 5.7–6.5 mm (allotype 6.0 mm).

TYPES. Holotype, male, Wafer Bay, Cocos Island, Costa Rica, collected in Malaise trap, at Station 3 (Rio Genio, 200 m south of river's mouth), 24 March 1978, by C.L. Hogue and S. Miller. Allotype, same label data as for holotype. Paratopotypes: 25 ♀♀, 17–22 April 1975, C.L. Hogue; 1 ♀, 24 March 1978; 1 ♂, 4 ♀♀, 25 March 1978; 1 ♀, 26 March 1978; 3 ♂♂, 4 ♀♀, 27 March 1978; all 1978 specimens from Malaise traps, C.L. Hogue and S. Miller.

DIAGNOSIS. *Limonia* (*Caenoglochina*) *paniculata* most closely resembles *L. (C.) apicata subapicata* Alexander of Florida (U.S.A.) and the Amazonian species *L. (C.) egae* (Alexander) (from Ega, or Teffé, Brazil) and is very similar to *L. (C.) napoensis* (Alexander) (from Rio Napo, an Amazonian tributary, Peru) (Alexander 1921:49–50, figs. 10, 11). *L. (C.) fieldi* Alexander (1967:281, figs. 1, 4), from Honduras, shares with these species the ridge of thick black setae along the margin of the dististyle and the complex basistylar lobes, but it does not have the blackened blade on the dorsal apex of the dististyle. *L. paniculata* differs from all other species in the subgenus in the number, shapes, and arrangement of the basistylar lobes and the complexity of their setae.

ETYMOLOGY. The specific name is derived from the presence of the six setiferous lobes (Latin *paniculata* = tufted).

Limonia (*Geranomyia*) species

Four species of the subgenus *Geranomyia* were identified from among the specimens available. These include *L. (G.) cocoensis*

Alexander, *L. (G.) wigginsii* Alexander, *L. (G.) lycaon* Alexander (= *pallida* Williston), and an apparently undescribed species. Ernest M. May (University of Kansas) is preparing a separate report on *Geranomyia*.

Helius brunneus new species

Figures 12–17

DESCRIPTION. Description based on 19 ♂♂, 4 ♀♀, and one specimen without abdomen, all pinned.

Head. Occiput dark brown; eyes in both sexes large, nearly contiguous, separated on vertex and ventrally by only width of one or two ommatidia. Rostrum and maxillary palps brown; rostrum subequal in length to rest of head in both males and females. Scape and pedicel brown, somewhat depressed; pedicel with subterminal ring of appressed, dark setae; flagellum of 14 flagellomeres, brown, with numerous short, pale hairs, and with most verticils 2–3 times length of their respective segments.

Thorax. Pronotum dull brown; mesonotal prescutum slightly polished brown to light brown, some individuals (including holotype) with indistinct darker brown median line and two submedian, setiferous lines. Depression between scutal lobes yellowish brown to brown. Scutellum and postscutellum light brown. Halteres dull dark brown. Pleural surfaces slightly polished brown to light brown; coxae dull brown, hind coxae with numerous dark setae on posterior surface, other coxae with few, scattered setae. Femora, tibiae, and proximal three-fourths of basitarsi brown, grading into yellowish white on apical one-fourth of basitarsi. Tarsomeres 2–4 nearly white; 5 yellowish. Middle and hind basitarsi with mesal spurlike, elongate seta just beyond end of tibia.

Wings (Fig. 16) strongly tinged with grayish brown, stigma distinct but not conspicuously darker than ground color. Veins R_{2+3} and R_{4+5} generally parallel for half their length beyond level of r-m, diverging near apex of wing. Cross-vein r-m short but present in some individuals, absent by contact of R_{4+5} and M_{1+2} in others. Cell 1st M_2 large, about twice as long as greatest width. Cross-vein m-cu approximately in alignment with r-m, shorter than or subequal to basal section of M_{3+4} .

Abdomen of Male. Dark brown, terga and sterna 2–8 with mostly sparse, short hairs but longer, more numerous hairs near

◆Figures 1 through 15. *Limonia hoguei*, *L. paniculata*, and *Helius brunneus*. Upper scale, Figures 1–9, 12, 14; lower scale, Figures 10, 11, 15.

Figures 1 through 5, *Limonia* (*Rhipidia*) *hoguei* n. sp., male holotype. Figure 1, right antenna, lateral aspect. Figure 2, ninth abdominal tergum (9t), right basistyle, dorsal and ventral (vd) dististyles, dorsal aspect. Figure 3, right gonapophysis, mesal aspect. Figure 4, left basistyle, ventrolateral aspect. Figure 5, aedeagus and left gonapophysis (gon), ventral aspect.

Figures 6 through 11, *Limonia* (*Caenoglochina*) *paniculata* n. sp.; 6–9, male paratype, 10–11, female allotype. Figure 6, ninth abdominal tergum (9t), left basistyle (bs) and dististyle, dorsal aspect. Figure 7, left basistyle and dististyle, posteroventral aspect. Figure 8, left basistyle and dististyle, mesal aspect. Figure 9, aedeagus (aed) and right gonapophysis (gon), left lateral aspect (left basistyle removed). Figure 10, terminal abdominal segments, left lateral aspect. Figure 11, cerci and part of tenth tergum, dorsal aspect.

Figures 12 through 15, *Helius brunneus* n. sp., paratypes. Figure 12, terminal abdominal segments, male, dorsal aspect (most of right side omitted). Figure 13, basal portion of inner dististyle, enlarged to show minute spines. Figure 14, left basistyle and dististyles, aedeagus (aed) and phallosome (ps), right lateral aspect (right basistyle removed). Figure 15, terminal abdominal segments, female, left lateral aspect.

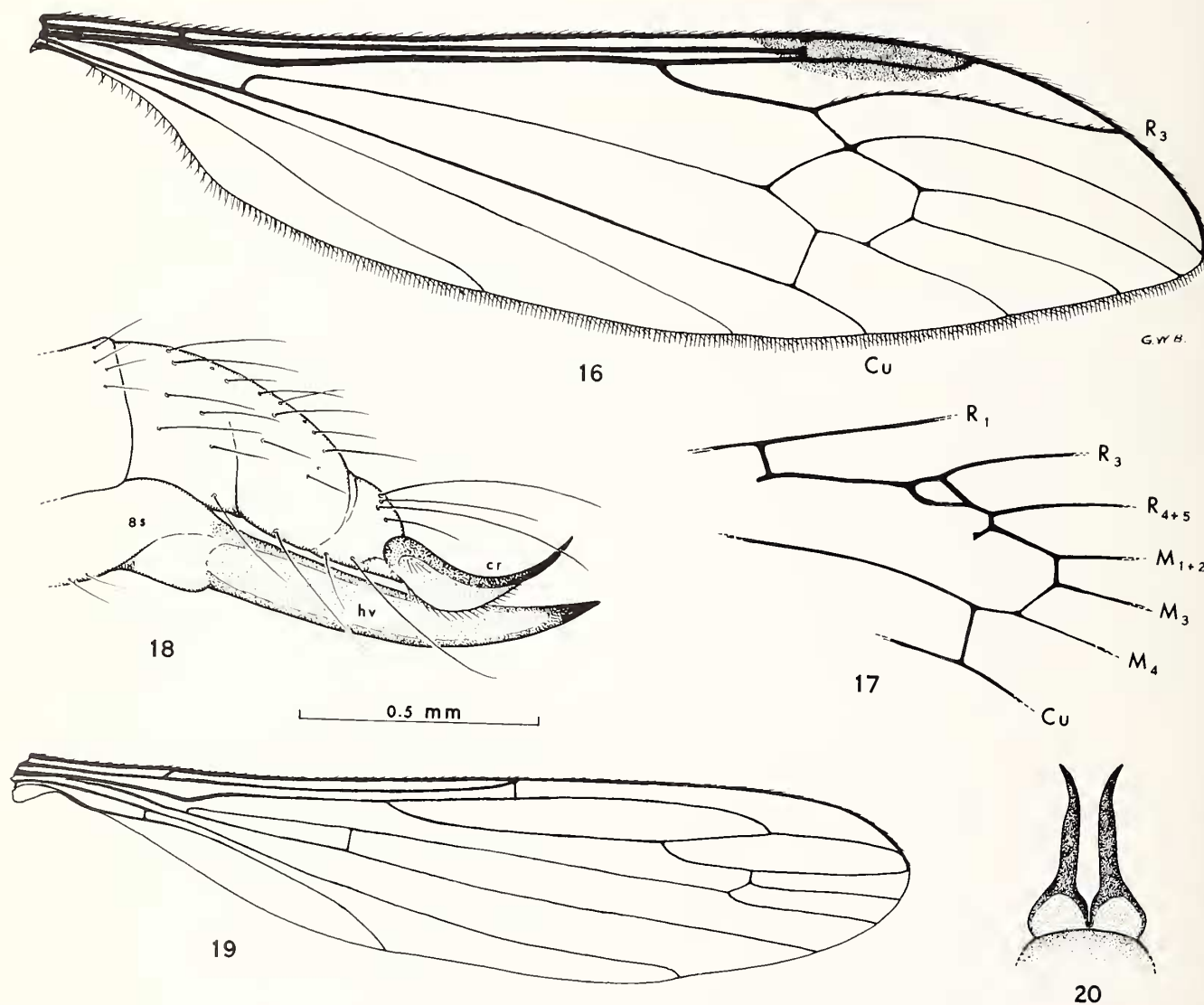
lateral margins. Ninth tergum (Fig. 12, 9t) with sparse marginal setae at either side of broadly U-shaped median emargination. Outer dististyle darkly sclerotized, slender, abruptly curved near apex to form hooklike tip; no lateral spine. Inner dististyle slender, unevenly curved inward and downward with single spine at apex and group of 4-5 microscopic, blackened spines on mesal surface near midlength (Fig. 13). Basistyle not prolonged conspicuously beyond level of attachment of dististyles. Phallosome bilobed, bearing two elongate, acutely tipped processes directed first downward into genital chamber, then curving upward and mesad (Fig. 14, ps). Aedeagus (Fig.

14, aed) stout, strongly curved to form nearly complete coil.

Abdomen of Female. (Fig. 15). Dark brown, with sparse, fine hairs shorter on terga than on sterna. Cerci long, slender, straight in basal half, curved evenly upward in apical half. Hypoalves slender, straight, tapering gradually to acute apex.

Length of body exclusive of rostrum and antennae, male, 4.8-6.1 mm (holotype 6.0 mm); female, 5.2-6.5 mm (allotype 5.2 mm). Wing length, male, 5.8-7.2 mm (holotype 6.7 mm); female, 5.8-6.3 mm (allotype 5.8 mm).

TYPES. Holotype, male, Wafer Bay, Cocos Island, Costa Rica, collected at 15-watt ultraviolet light trap, at Station 6



Figures 16 through 20. *Helius brunneus* and *Orimarga flavescens*. Scale, Figures 18, 20.

Figures 16 and 17, *Helius brunneus* n. sp., wings, male paratypes. Figure 16, normal wing venation (wing length 7.3 mm). Figure 17, abnormal wing venation of discal area (R-radius, M-media).

Figures 18 through 20, *Orimarga (Diotrepha) flavescens* n. sp., female holotype. Figure 18, terminal abdominal segments, left lateral aspect; 8s-eighth sternum, cr-cercus, hv-hypoalve. Figure 19, wing venation (wing length 5.1 mm). Figure 20, cerci, dorsal aspect.

(Rio Genio, 200 m south of river's mouth), 27 March 1978, by C.L. Hogue and S. Miller. Allotype, female, and 3 ♂♂, 1 ♀ paratypes, Rio Genio, Cocos Island, 27 March 1978. Additional paratypes: Wafer Bay, 17–22 April 1975 (5 ♂♂, 2 ♀♀, 1 without abdomen); Wafer Bay, at UV light, 27 March 1978 (2 ♂♂); Rio Genio, 25 March 1978 (8 ♂♂).

DIAGNOSIS. *Helius brunneus* belongs to the *albitarsis* group and, on the basis of size, structure, and color, appears to resemble most closely *H. micracanthus* Alexander from the state of São Paulo, Brazil (Alexander 1945a) and, somewhat less closely, *H. rectus* Alexander from the Federal District of Brazil (Alexander 1945b). *H. micracanthus* is slightly smaller in body and wing length, to judge from the type specimen. In *H. brunneus*, the basitarsi are less extensively white than in *micracanthus*, and the halteres are dusky brown, not "dirty white." The inner dististyle is markedly more curved than in *micracanthus*. The two species have in common the strongly curved processes of the phallosome. In *brunneus*, the r-m cross-vein is often absent, but a larger sample of *micracanthus* might show that this is also true of that species.

ETYMOLOGY. Although the body color of *brunneus* is not diagnostic, the species takes its name from that characteristic (Latin *brunneus* = brownish).

REMARKS. A striking venational anomaly was observed in one individual. This involved the area of the discal cell (cell 1st M_2) and the radial sector (Fig. 17). Near its origin, the Rs is angular, with a short spur vein; the discal cell is not formed, and the veins in that area of the wing are thickened and atypically arranged (cf. Fig. 16).

Orimarga (Diotrepha) flavescens new species

Figures 18–20

DESCRIPTION. Description based on one female and one individual with abdomen broken off, both pinned.

Head. Occiput grayish brown with sparse, long, yellow setae; vertex and frons paler, sordid yellowish brown; rostrum and maxillary palps brown. Eyes black, large, only narrowly separated on vertex and ventrally behind rostrum. Antennal scape brown, pedicel light brown, flagellum dull yellowish, with 14 flagellomeres, most bearing verticils subequal to their length, except apical flagellomere with four nearly terminal setae twice its length.

Thorax. Pronotum yellowish brown; prescutum, scutum, and scutellum dull yellowish; postnotum (postscutellum) yellowish brown. Pleural sclerites and coxae dull yellowish. Femora of middle and hind legs nearly white except for apical black band (about 8% of total femoral length). (Both front legs missing from holotype.) Tibiae white, with narrow, black apical band. Basitarsus pale grayish white, tarsomeres 2 and 3 light gray, 4 and 5 dark gray. Ratio of femur: tibia: basitarsus: tarsomeres 2: 3: 4: 5 = 85: 83: 54: 13: 5: 2: 2. Claws simple, strongly curved.

Wings (Fig. 19) lightly tinged with yellowish gray, without stigmal darkening; veins yellow. Sc joins C shortly before level of midlength of Rs; Sc_2 at apex of Sc_1 . R_1 curves evenly to join

R_{2+3} ; no vein R_{1+2} (this vein possibly indicated by faint deflection in R_1 just before junction with R_{2+3}). R_{4+5} nearly perpendicular to Rs and R_{2+3} at their junction. Cross-vein m-cu about three times its length before level of origin of Rs; cross-vein r-m approximately its length beyond fork of M. Halteres grayish yellow.

Abdomen of Female. General coloration yellowish, with light brown, transversely wrinkled annulations at posterior ends of segments 2–4 and paler annulation at end of segment 5. Abdomen long, slender; length of segments 2–6 about 3.5–4 times their greatest diameter. Segments 7–8 short, enlarged abruptly in diameter from 6. Terga 9 and 10 fused dorsally, partially separated laterally (Fig. 18). Cerci short, not contiguous dorsally (Fig. 20), expanded laterally at base, somewhat concave ventrolaterally, with setiferous ventral margin; apex glabrous, densely sclerotized, conspicuously upturned and sharp. Hypo- valves more than twice length of cerci, only slightly upcurved to sharp tip, strongly sclerotized in apical one-third and along dorsal and ventral margins.

Body length (frons to tip of hypo- valves) of female holotype about 7.6 mm. Wing length 5.1 mm. Hind femur 5.0 mm. Antenna about 1.2 mm.

TYPES. Holotype, female, Wafer Bay, Cocos Island, Costa Rica, collected in Malaise trap, at Station 3 (Rio Genio, 200 m south of river's mouth), 26 March 1978, by C.L. Hogue and S. Miller. Paratype (abdomen broken): Chatham Bay, 22 January 1967, I.L. Wiggins.

DIAGNOSIS. *Orimarga (Diotrepha) flavescens* is apparently most closely related to *Orimarga (D.) omissinervis* Alexander, a species known only from Bolivia (Alexander 1913). Like *O. flavescens*, that species has pale legs with darkened femoral and tibial apices and lacks vein R_{1+2} ; however, it has a brown thorax, dark brown abdomen, and grayish wings and is somewhat larger than *flavescens*.

ETYMOLOGY. The specific name refers to the general coloration of this fly (Latin *flavescens* = yellowish).

Gonomyia (Lipophleps) puer Alexander

This species is widespread from southern United States to Mexico, Central America, and northern South America (Ecuador, Guyana, Peru), including the West Indies. Cocos Island records: in Malaise trap, Station 3 (Rio Genio), Wafer Bay, 24 March 1978 (3 ♀♀), same but 25 March (8 ♀♀), same but 26 March (2 ♂♂, 8 ♀♀), same but 27 March (2 ♀♀); light trap, 15-watt UV, Station 4 (400 m south of mouth of Rio Genio), Wafer Bay, 24 March 1978, (2 ♂♂, 1 ♀), same but Station 6 (200 m south of mouth of Rio Genio), 27 March (1 ♂); all collected by C.L. Hogue and S. Miller. On 22 January 1967, I.L. Wiggins collected 13 ♀♀ at Chatham Bay (Bahia de Chatham).

Gonomyia (Paralipophleps) pleuralis (Williston)

Even more widespread than *Gonomyia puer*, this species ranges from southeastern United States through the West Indies and

Bermuda to Brazil, Bolivia, Guyana, and Peru. Cocos Island records: Wafer Bay, 17–22 April 1975, C.L. Hogue (1 ♀); in Malaise trap, Station 3 (Rio Genio) Wafer Bay, 24 March 1978 (1 ♀), same but 25 March (1 ♀), same but 26 March (1 ♂, 5 ♀♀); light trap, 15-watt UV, Station 2 (Rio Genio at first rapids above high tide level), Wafer Bay, 23 March 1978 (3 ♀♀), same but Station 6 (Rio Genio), 27 March (1 ♂); all collected by C.L. Hogue and S. Miller. The I.L. Wiggins collection, made at Chatham Bay, 22 January 1967, contains 30 individuals (2 ♂♂, 28 ♀♀ or lacking abdomen).

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